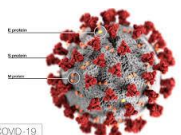


Covid-19 Primer for BHHSURG

April 6, 2020
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Med-Quest Medical Director

“The only thing we have to fear is fear itself” FDR



Terminology: More Informed Than Media

Coronavirus = name of a class of virus.

Seven different coronavirus, including one subtype that causes COVID-19.

Covid-19 = Name of Disease

SARS-CoV-2 = Name of Virus

Flu is the name of a **disease** caused by the **Influenza virus**.

COVID-19 is the name of a **disease** caused by the **SARS-CoV-2 virus**.

Naïve Population:

Covid 100% population Naïve vs Flu with 2/3 elderly immunized for influenza.

At minimum Covid 3x susceptible elderly population vs Flu.

Case Fatality Rate (CFR):

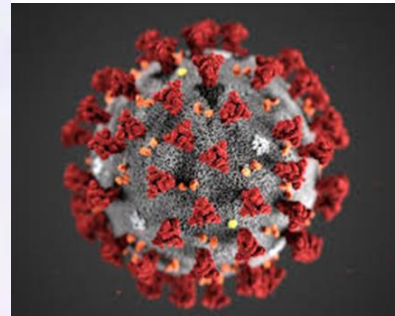
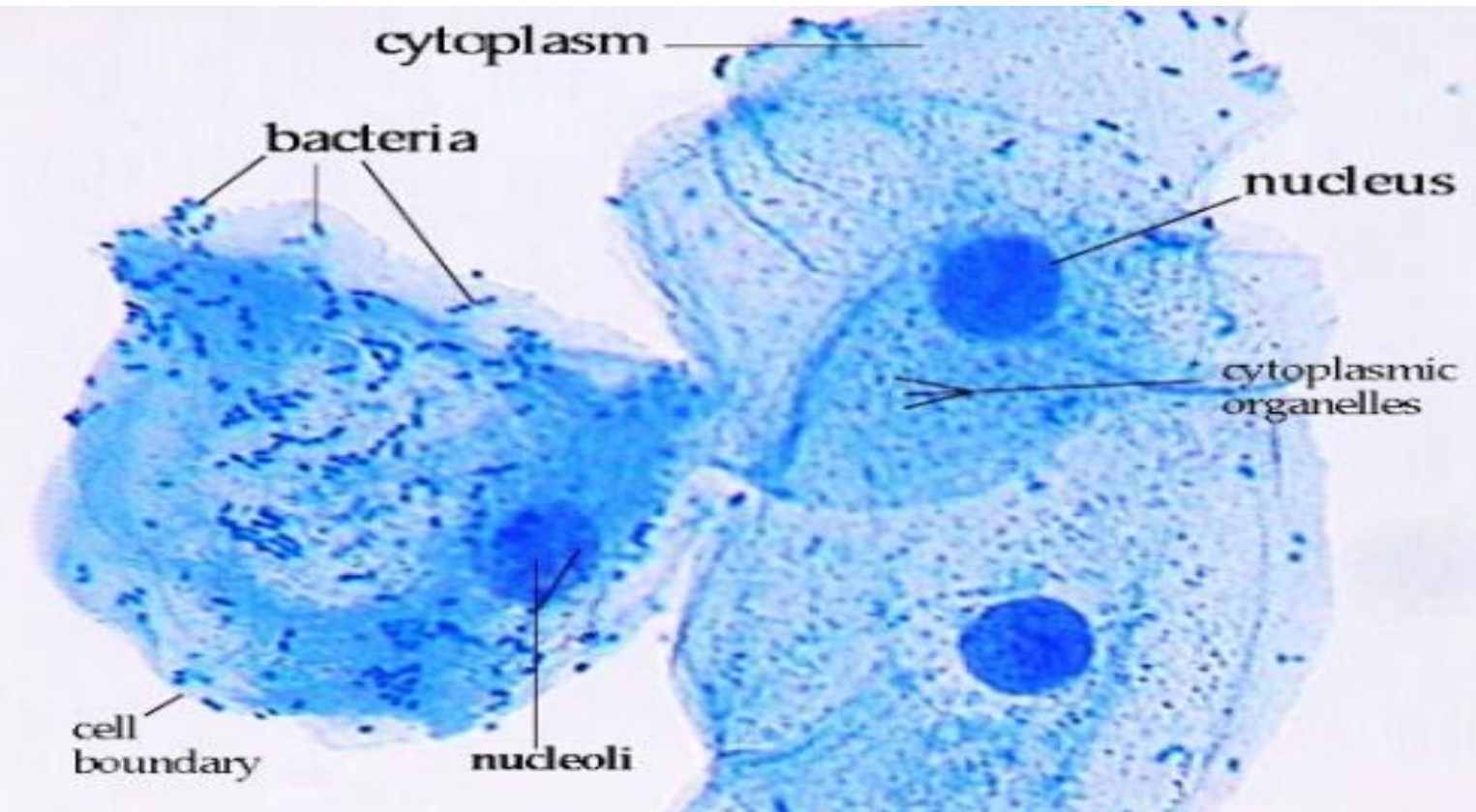
Chance of death from a certain disease in a person who has the disease.

Considerations: When in course of outbreak, # cases vary with # tests, location, age.

Virus vs Bacteria

Bacteria within Cells below.

Coronavirus: 1/10 Diameter of Bacteria (Staph or Strep), Relative Size, Replication-Host, Antibiotic vs Antiviral, Childhood Imm: Virus > Bacteria



Coronavirus (7)

- 4 Coronavirus > common cold (URI)
 - Second most common cause of the common cold after rhinovirus.

- 3 Novel Coronavirus (All 3 Zoonotic Disease)

- SARS (2002): Origin Bats > Civets > Human
- MERS (2012): Origin Bats > Camel > Human
- SARS-CoV-2 (2019): **Origin Bats > ? Host > Human**





Bats: Viral Reservoir, Viral Diversity, RNA, high metabolism.

SARS, MERS, SARS-CoV-2:

Bats > Civets/Camels/? > Humans

Hemorrhagic Fever Ebola:

Bats > Primates > Human

Hemorrhagic Fever Marburg:

Bats > > Humans

Historical Context: Legends (Vampires, Werewolves) and Rabies

Animal/Bat Saliva > Bite > Rabies > Nerves > Encephalitis > Neurologic Sequelae

Smallpox and 1st Imm

Smallpox devastating disease > 1st Imm

Variolation > Vaccine, 1796

Cowpox vs Smallpox

Vaccine: Latin Origin, Vacca = Cow

Smallpox eradicated:

1949 (U.S.), 1980 (Worldwide)



Three members of a family brought to the Municipal Hospital. The child in the centre was unvaccinated; the other two had vaccination requirements. These two children remained in small-pox.



Novel Coronavirus and Case Fatality Rate (CFR)

Virus	Cases	Deaths	CFR
SARS (2002)	~10,000	800-1000	10%
MERS (2012)	~ 3,000	900	35 %
SARS-CoV-2	1.3 M	70 K	?
SARS-CoV-2 (U.S.)	340 K	10 K	?
Influenza (Worldwide)	10% pop	300K – 600K	0.1 %
Rabies		50 K	100%
Smallpox	0	0	~ 20 %

CFR: Chance of death from a certain disease in a person who has the disease.

- Time relative to surge curve, Age, Denominator, Location

Covid-19 vs Flu

U.S.	Cases	Hosp	U.S. Deaths
Flu	40 – 60 M	400 – 800 K	25 – 60 K
Covid-19	340 K	?	10 K

Hawaii (Oahu)	Cases	Hosp	HI Deaths
Flu	100,000	1200/yr	~100-150/yr
Covid-19	371	21	4

Assumptions:

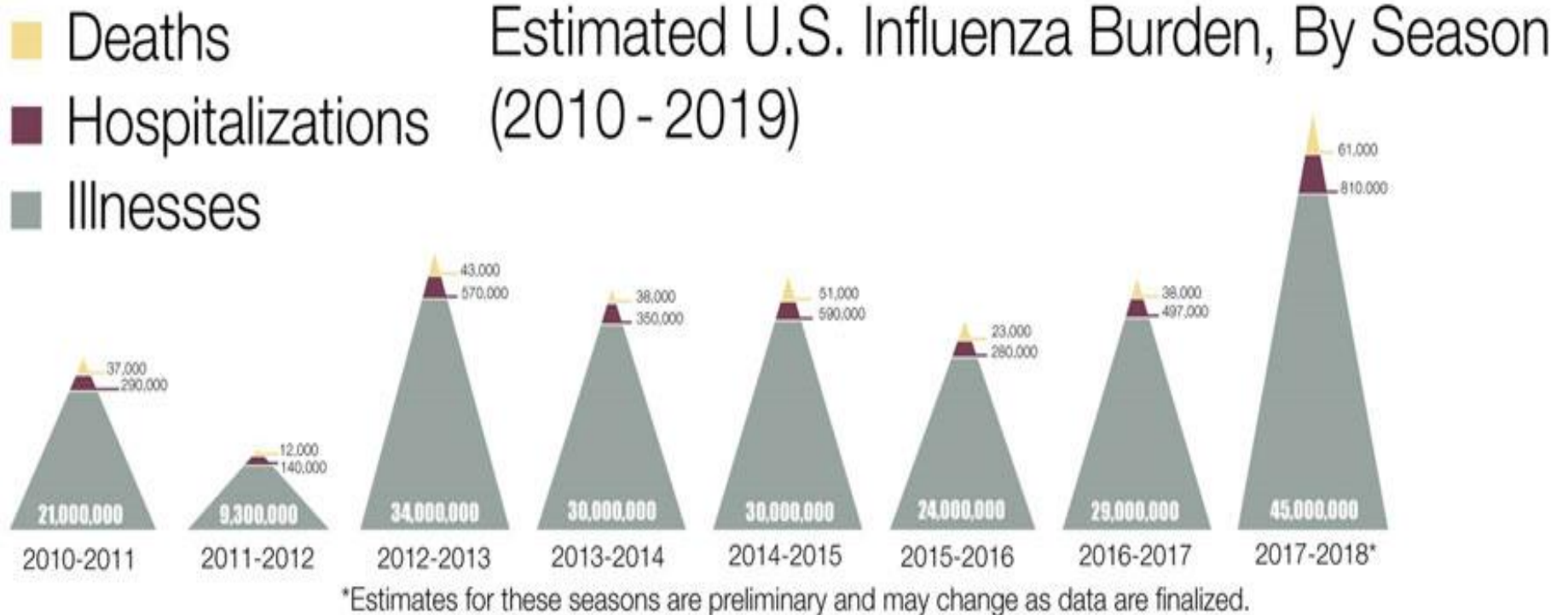
- Influenza cases 10% of population, hosp 1-2% cases, deaths 10% hosp
- Influenza 2/3 elderly immunized, Covid no immunization to date (Naïve population)
- Covid 3x susceptible elderly population vs influenza
- Influenza = season, Covid-19 = compressed timeline (Naïve population)
- Covid more infectious and more lethal than influenza

Influenza (U.S.) Deaths estimated from past 3 years CDC data

Covid-19 vs Influenza Pandemics

<u>Influenza Pandemic</u>	<u>U.S. Fatalities</u>
H1N1 Flu (2009)	13 K
Hong Kong Flu (1968)	100 K
Asian Flu (1957)	115 K
Spanish Flu (1918-1919) (H1N1)	700 K
 Covid-19	 10K and rising (est 100 – 250 K)

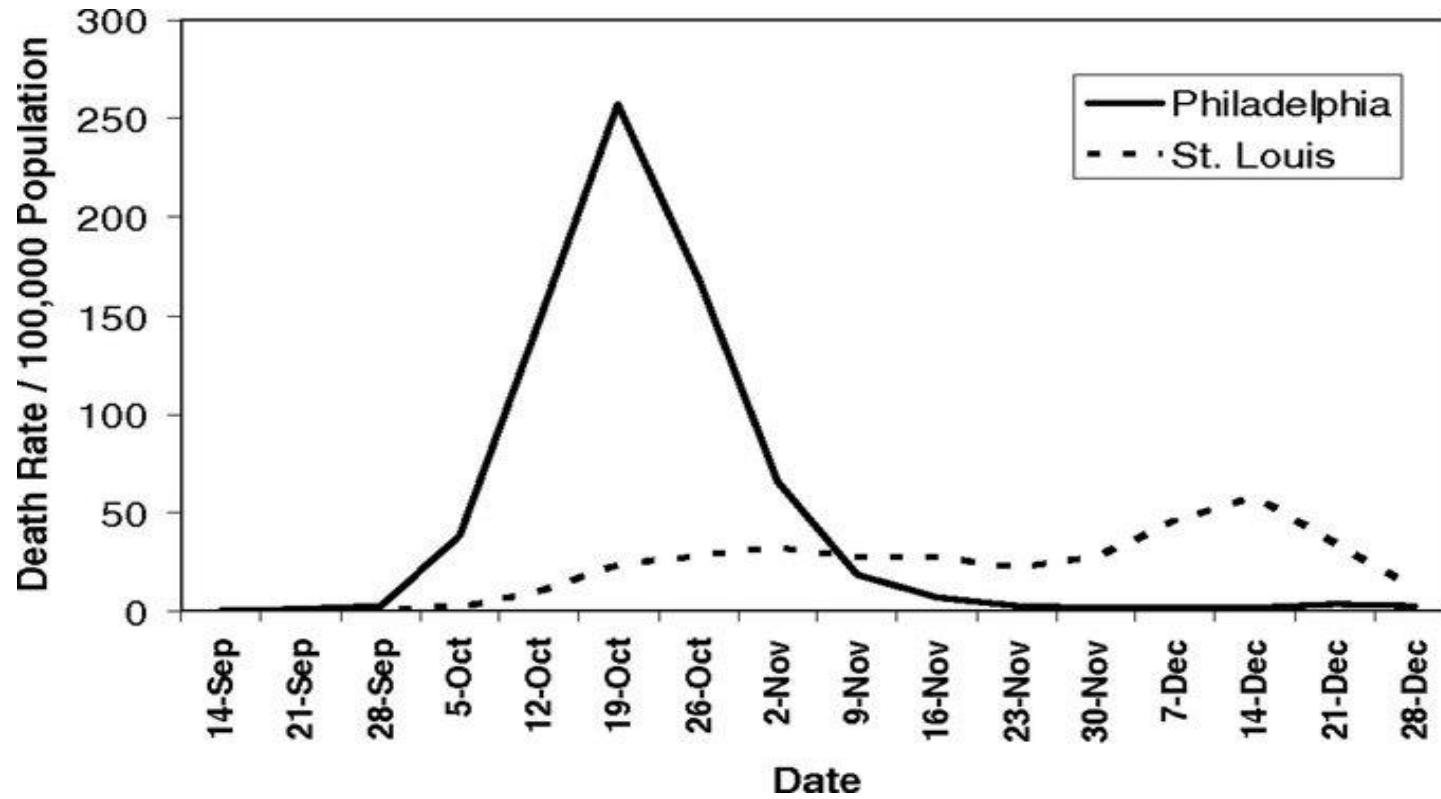
Flu compared to Covid-19



Influenza cases 10% of population, hosp 1-2% cases, deaths 10% hosp, CFR ~ 0.1 %
2019-20: 26M cases, 250K hospitalized, 14K deaths

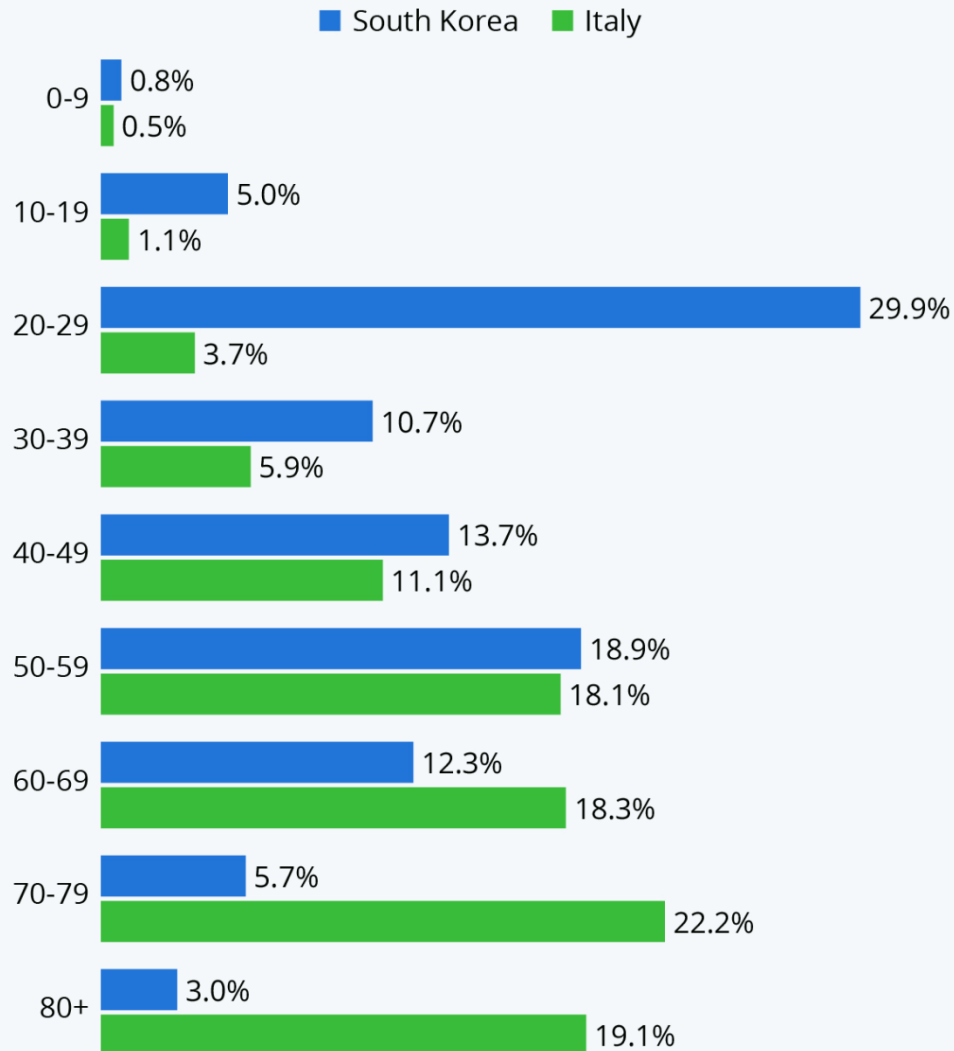
Source: CDC www.cdc.gov/flu/about/burden/index.html

1918 Spanish Flu Pandemic



How Does the Coronavirus Affect Different Age Groups?

Breakdown of confirmed coronavirus cases by age in South Korea and Italy (in percent)

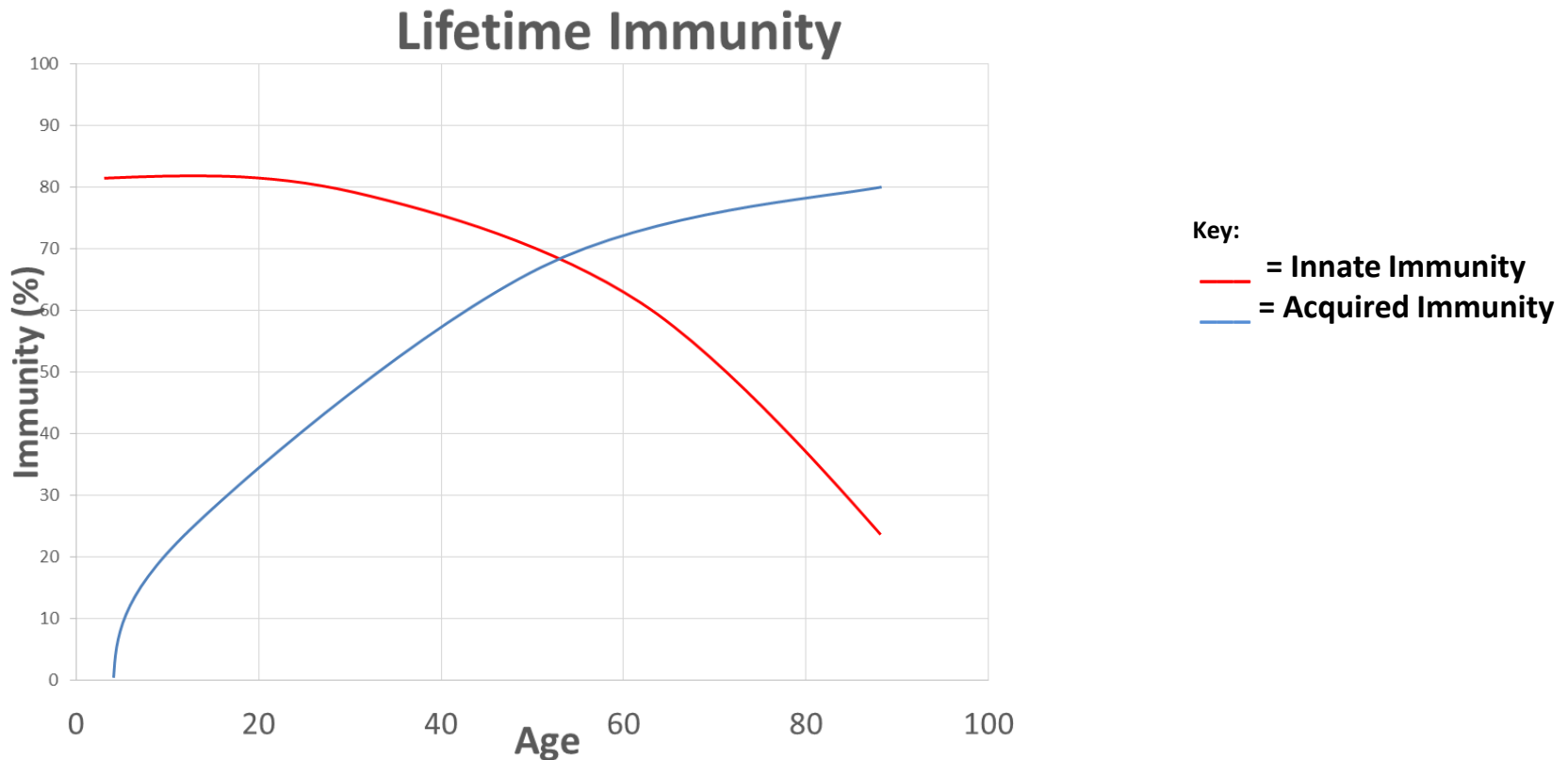


Published March 13

Source: Andreas Backhaus (German Federal Institute for Population Research) via Medium

Covid-19 Prognosis and Age

- Age independent RF
 - CFR increase with age
 - More underlying health conditions with age does not fully account for increase
 - Functional reserve capacity of lungs decrease with age
 - Innate vs Acquired Immunity



Covid-19 U.S. Hot Spots

Region	Covid +	Hosp	ICU	Deaths	Recover
United States	330K			9.5 K	17 K
NY (20 M)	130 K	16 K	4.2 K	5.2 K	12 K
NYC (8 M)	70 K	13 K	3.5 K	2.6 K	
NJ (9 M)	40 K			920	
MI (10 M)	16 K			620	
LA (4 M)	13 K	1800	560 (Vent)	480	
New Orleans (830 K)	7 K			270	
WA (8 M)	8 K			340	
King County (2 M, Seattle)	3.2 K			210	
Hawaii (1.4 M)	371	21	5	4	85
Hawaii Hospitals Beds		(1500/2800)	(120/340)		
Hawaii Vents	91/535				

King County (Seattle): Age > 70 yo account for 80 % deaths (170 / 210).

Life Care NF: Fatalities (34/81 residents, 0/47 staff)

WA: 93 % deaths in Age > 60.

NY: Age > 75 yo are only 8 % cases, but 50 % hosp and ¾ Fatalities. 83% hosp > 65 yo.

Covid-19 Hawaii vs other State

<u>Hawaii</u>	<u>State Rank</u>
Population	# 40
Covid Testing per Capita	# 10
High per capita test + test early	# 3
# Covid Cases	# 44
# Covid Cases per capita	# 45
# Active Covid cases	# 45
Covid Deaths	# 46
Covid Deaths per capita	# 48

States with high per capita but testing late in the course of outbreak: NY, NJ, LA, MA, WA.

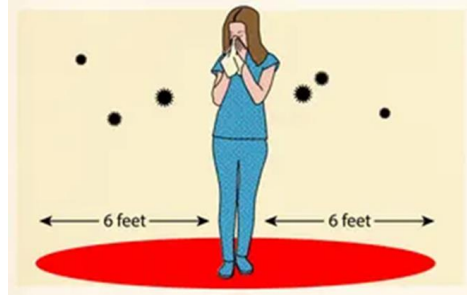
States with high per capita testing and earlier in outbreak: UT, AK, ND, HI.

www.worldometers.info/coronavirus/country/us/

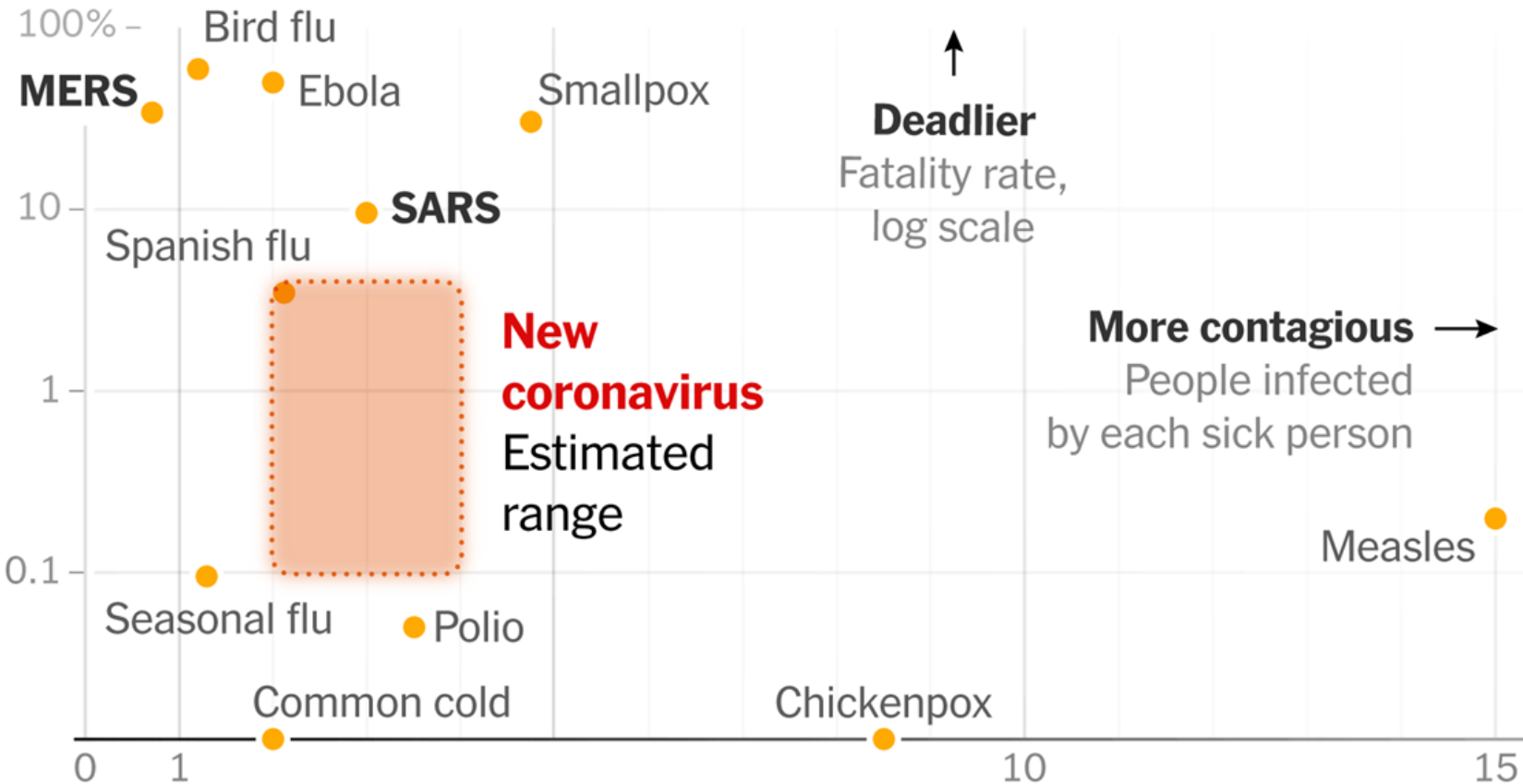
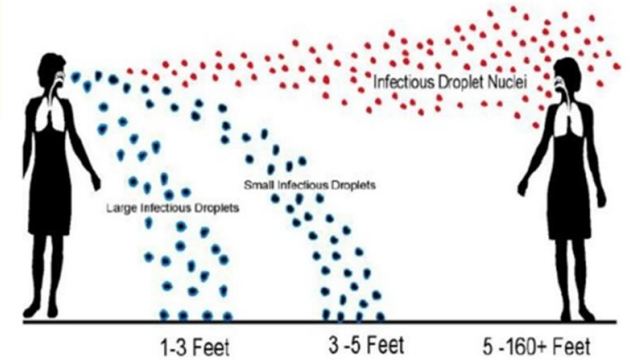
Covid Data: Hawaii Relative to Other States

- Testing Occurring relatively early in outbreak relative other states.
 - S. Korea vs Italy and NY
 - Hawaii ramped up testing relatively early in outbreak
- Surveillance Testing
 - Thru 3/20 Neg, Thru last week 1+
- % positive (case +) / (case tested)
 - NYC $\frac{1}{2}$, NY State $\frac{1}{3}$
 - Hawaii 260 / 9000 ~ 3 %
- Hawaii
 - Population # 40/50
 - Cases # 42/50
 - Deaths # 48/50

SARS-CoV-2 Infectivity



Infectious Droplets & Droplet Nuclei travel lengths



Children and Coronavirus

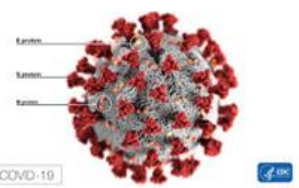
–Children 3 A's: **Allergies**, Atopic dermatitis (Eczema, Rash), **Asthma**





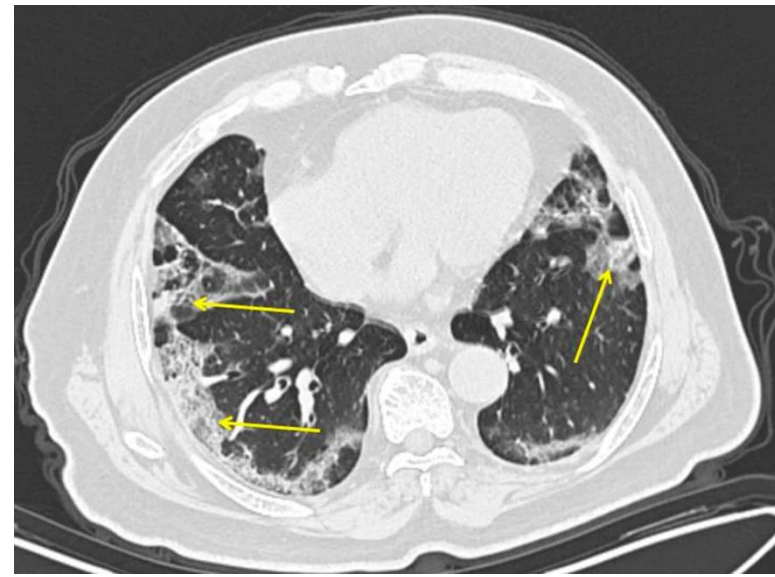
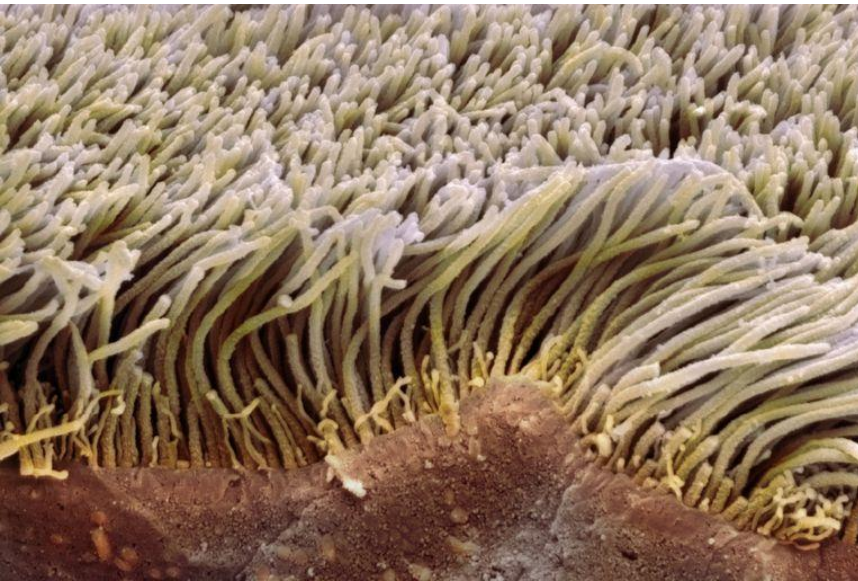
Andrew was infected with the virus when he was skiing in Italy

(clockwise top left) Elizabeth Schneider (Seattle , age 37), Jaimuay Sae-Ung (Thailand after visit to Wuhan, age 73), Bridgett Wilkens (Australia after attending wedding in Singapore, age 29) and Andrew O'Dwyer (UK after ski trip to Italy, age 52)
All had firsthand experience with Covid-19.



Covid-19: Tobacco, Vaping, Marijuana

- Hubei Province: Tobacco (2.4 x) more likely require ICU/Vent
- U.S.: Vaping RF younger adults (20-44) require Hosp
- Destroys cilia in lung tissue which help clear virus,
 - Decrease clearance of other pathogens, higher risk secondary respiratory infections
 - Influenza, bacterial/viral pneumonia, TB
- Smokers (14 x) more likely develop pneumonia
- Chronic Resp Disease (COPD) : Increase CFR (3 x)
- Meth: Resp binds to pulm tissue, CHF, dentition, social RF



of cases



Adapted from CDC / The Economist



Masks

- CDC Flip Flop: No > Maybe > Yes
- Mask better than no mask, Yes - Assumptions
 - **No change in behavior** (SD, Face Touch)
 - Use and reuse appropriately, don't share masks
 - General public not using N95 at expense of HCW
- Local hospital accepting homemade masks
- Facial Skin Lesions and Telederm



50PCS



Summary

— National

- Children and Young Adults do very well. Increase Screening.
- ? Seasonal, ? Geography, Healthcare Infrastructure
- Increase Capacity: hospital/ICU beds, hosp D/C options, Vents, PPE

— Hawaii

- High Testing per capita
- High Surveillance screening by DOH
- Overall trending better than other states
- Leadership Aligned, Clinical Input, Ohana/Aloha
- Influenza peaked early March and trending down
- Strong Interventions relatively early in course of outbreak
- Advantage Learning Curve from other states (NY, LA, WA)

— Personal

- Anticipate Wave, No need to panic but need to prepare
- You will be OK, remember the pyramid. Some others more at risk.
- Retrospective Review a year from now. Organization, Individual.
- The Children Are Watching

Don't Be Afraid... Be Helpful



"In The Middle Of Every Difficulty Lies Opportunity" Einstein